




Friday, November 22, 2024. Session 84 (Grand Ballroom East)

Advances In The Diagnosis And Treatment Of Near Total Occlusions And String Signs Of The Internal Carotid Artery (ICA) In Symptomatic And Asymptomatic Patients: How Are They Best Treated: What Do The Current Guidelines Say?


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NO DISCLOSURES RELATED TO THE TOPIC

C. Liapis


Carotid near occlusion: Definition

Carotid near-occlusion is a **severe** carotid stenosis where the internal carotid artery (ICA) distal to the stenosis is reduced in size **with or without lumen collapse**

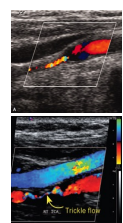


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Carotid near occlusion: Synonyms



*critical stenosis,
 near total occlusion,
 sub-occlusion,
 functional occlusion,
 pre-occlusion,
 pseudo-occlusion,
 string sign,
 slim sign,
 hypoplasia,
 lotus root sign,
 99% stenosis*




E. Johansson and A.J. Fox J. Neuroradiology 2016

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Radiological criteria for the diagnosis of ICA near occlusion

- reduction in ICA diameter compared with the ipsilateral ECA
- reduced diameter of the ICA compared with the contralateral ICA
- near-occlusion with full collapse: distal ICA diameter ≤ 2.0 mm and/or ICA/CCA ratio ≤ 0.42



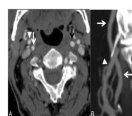
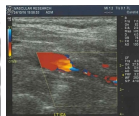

Johansson E. et al. Neuroradiology 2022

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Diagnosis of carotid near occlusion

DSA vs Duplex Ultrasound vs CTA vs CEMRA

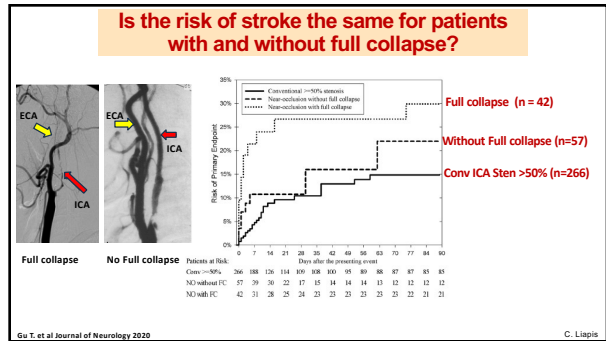
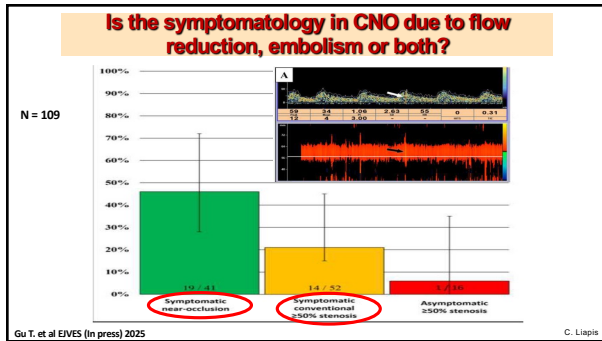
	DUS	CTA	CEMRA
Sensitivity – %	Occlusion	97	97
	Stenosis	89	75–85
Specificity – %	Occlusion	99	99
	Stenosis	84	93–96

ESVS Carotid Guidelines 2023

E. Johansson and A.J. Fox J. Neuroradiology 2016

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ICA near occlusion

Pooled data from NASCET, ECST, VA:
5-year risk of any stroke among symptomatic patients

CETC: 5-Year Risk of Any Stroke (Including 30-Day Stroke or Death) from the Combined VA, ECST, and NASCET Trials⁷

Trial	Stenosis	n	5-Year Risk					Strokes Presented per 1000 CEA at 5 Years ^a	
			30-Day CEA Risk (%)	Surgery (%)	Medical (%)	ARR (%)	RRR (%)		
CETC	<9%	1746	Unknown	18.36	15.71	-2.6	N/B	N/B	None
CETC	10-49%	1429	6.7	22.80	25.45	+2.6	10	38	26
CETC	50-99%	1541	6.4	20.80	27.27	+7.8	28	11	78
CETC	70-99%	1095	6.2	17.11	32.71	+15.6	48	6	136
CETC	Mean (sp)	382	5.4	21.48	23.38	-8.1	N/B	N/B	None

No benefit of surgery over BMT for symptomatic patients with **string sign** at 5 years

Rothwell et al, Lancet 2003

CRITICISM ON CETC POST HOC ANALYSIS

- ECST Inclusion criteria: **No mention** of string sign cases
- Only 16 / 262 (6%) of the patients in the CETC analysis had fully collapsed ICA
- 33 of 114 (28.9%) of BMT only patients with CNO, switched to the CEA, but were analyzed as BMT alone by **intention to treat analysis**
- Although no benefit from CEA was recorded at 5 years, there was a **trend towards benefit from surgery at the 2 year follow up (ARR 5.6%, p = .19)**

De Borst G, Antonopoulos C, Meershoek A, Liapis CD
Editorial, Eur J Vasc Endovasc Surg 2020

String sign carotids were excluded from recent RCTs !!!

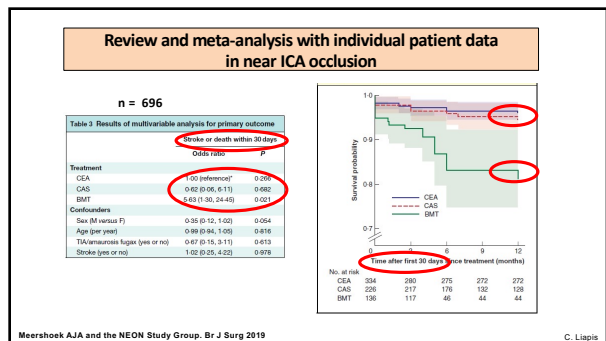
Anatomic Exclusions

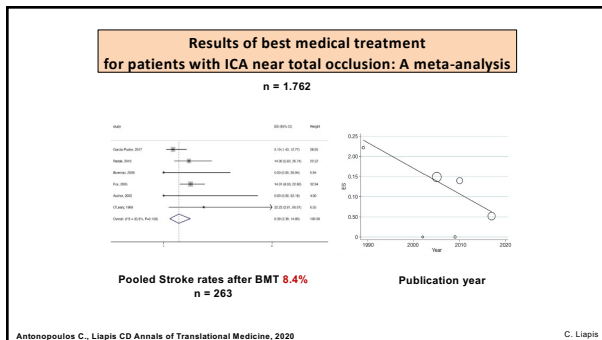
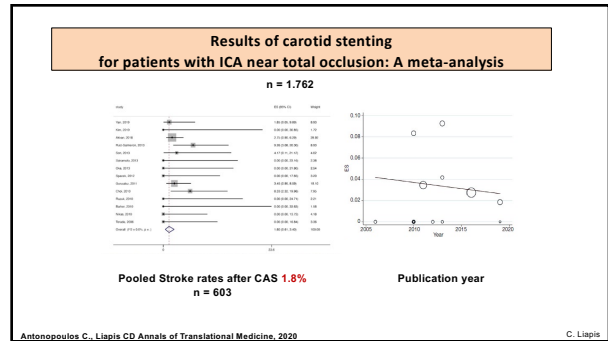
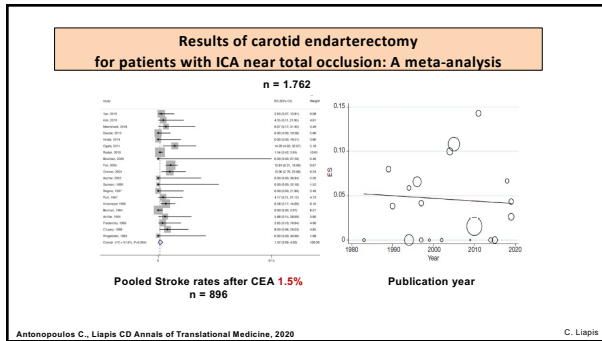
ICSS, 2010 common carotid artery stenosis, or internal carotid artery pseudo-occlusion were excluded, as were patients unsuitable for endarterectomy because of the distal site

CREST, 2010 "string sign" <1 cm of the ipsilateral common or internal carotid artery.

CREST- 2 32. "String sign" of the ipsilateral common or internal carotid artery.

Antonopoulos CN, Tzavellas G, Bouris V, Avgerinos E, Liapis CD. HIVES 2023





2022 SVS Clinical Practice Guidelines for management of extracranial cerebrovascular disease

“The presence of a carotid string sign in which the extra and intracranial ICA is diminutive may be a relative contraindication for CEA”

“It is unclear how the presence of a carotid string sign impacts patient outcomes after transfemoral CAS”.

NO RECOMMENDATION

AbuRahma A. et al. *J Vasc Surg* 2022 C. Liapis

Recommendation 56		Unchanged	
For symptomatic patients with carotid near occlusion and distal vessel collapse, carotid endarterectomy and carotid stenting are not recommended , unless as part of a randomised controlled trial.			
Class	Level	References	ToE
III	B	Rothwell et al. (2003) ³⁵⁷	
Recommendation 57		New	
For patients with carotid near occlusion and distal vessel collapse with recurrent carotid territory symptoms (despite best medical therapy), carotid endarterectomy or carotid artery stenting may be considered only after multidisciplinary team review.			
Class	Level	References	ToE
Iib	C	Meershoek et al. (2019) ¹⁶ , Xue et al. (2020) ¹⁵¹ , Garcia-Pastor et al. (2017) ¹²⁶ , Meershoek et al. (2018) ¹²³	

Naylor R. et al. *Eur J Vasc Endovasc Surg*, 2023 C. Liapis

2023 ESVS Practice Guidelines

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Naylor R. et al. Editor's Choice - European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease. *Eur J Vasc Endovasc Surg*, 2023 Jan;46(1):7-111. C. Liapis

ESVS Practice Guidelines 2023 Edition

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Naylor R, et al. Editor's Choice - European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease. Eur J Vasc Endovasc Surg. 2023 Jun;45(1):7-111.

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Endarterectomy, Stenting, or Medical Treatment for Symptomatic Carotid Near-Occlusion: Results from CAOS, a Multicenter Registry Study

n=141 (CEA 23, CAS 44, BMT 74)

Success rate: CEA 87%, CAS 82%

"Our study has not been able to show clear differences in the risk of recurrent stroke at 2 years among the different treatment groups".

García-Pastor A, et al AJNR Am J Neuroradiol. 2022. C. Liapis

Effect of Treatment Choice on Short-Term and Long-Term Outcomes for Carotid Near-Occlusion: A Meta-Analysis

Study	Events Total	Events per 100 observations	Events (95% CI)
TIA beyond 30 days			
BMT	18/181		4.50 (0.67-24.71)
CAS	3/287		1.12 (0.38-3.42)
CEA	11/479		0.71 (0.04-12.23)
stroke beyond 30 days			
BMT	42/338		9.50 (3.21-21.16)
CAS	8/970		0.79 (0.24-2.53)
CEA	28/949		0.80 (0.15-4.07)

Subgroup analysis: statistically significant (P < 0.001).

Meta-regression (CAS vs. BMT, P = 0.001; CEA vs. BMT, P = 0.003).

Gupta R, et al. World Neurosurgery Jan 2024. C. Liapis

Conclusions

- Near-occlusion of ICA is not rare, but frequently misdiagnosed.
- Both CEA and CAS seem to be safe and appropriate treatment for symptomatic patients with full collapse, with results superior to BMT for carefully selected patients, in dedicated centers.
- A downward trend in the stroke rates over time after CAS and BMT has been reported.
- Patients with near-occlusion of ICA, with or without full collapse, need to be included and investigated in future RCTs.

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